Roll No. : __________

Objective Paper Code **8197**

Intermediate Part Second - 252

MATHEMATICS (Objective) Group – I

Time: 30 Minutes Marks: 20

Q.No.1 **You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill the relevant circle in front of that question number on computerized answer sheet. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero marks in that question. Attempt as many questions as given in objective type question paper and leave other circles blank.beb**

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S.#	Questions	A	B	C	D
1	If α is the inclination of the line ℓ, then its slope is:	$\sin\alpha$	$\cos\alpha$	$\tan\alpha$	$\cot\alpha$
2	The lines represented by $ax^2+2hxy+by^2=0$ are imaginary if:	$h^2-ab=0$	$h^2-ab<0$	$h^2-ab>0$	$h^2-ab\neq 0$
3	Two lines $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$ are parallel if:	$a_1a_2+b_1b_2=0$	$a_1a_2-b_1b_2=0$	$a_1b_2-a_2b_1=0$	$a_1b_2+a_2b_1=0$
4	Equation of vertical line through (7 , – 9) is:	$x=7$	$x=-9$	$y=7$	$y=-9$
5	(1 , 0) is the solution of the inequality:	$7x+2y<8$	$3x+y>6$	$x-3y<0$	$-3x+y>0$
6	Length of tangent drawn from (0 , 1) to the circle $x^2+y^2+6x-3y+3=0$, is:	4	3	2	1
7	Vertex of the parabola $(y-3)^2=8(x+2)$ is:	(0 ,0)	(3 ,–2)	(–3 , 2)	(–2 , 3)
8	For hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$:	$b^2=a^2-c^2$	$b^2=c^2-a^2$	$b^2=a^2+c^2$	$a^2+b^2+c^2=0$
9	If $\bar{F}=4\underline{i}+3\underline{j}+5\underline{k}$ and $\bar{d}=-\underline{i}+3\underline{j}+8\underline{k}$, then work done is:	30 units	45 units	53 units	47 units
10	If $\underline{U}$, $\underline{V}$ and $\underline{W}$ are coterminous edges of a tetrahedron, then its volume is:	$[\underline{U}\ \underline{V}\ \underline{W}]$	$\frac{1}{3}[\underline{U}\ \underline{V}\ \underline{W}]$	$\frac{1}{6}[\underline{U}\ \underline{V}\ \underline{W}]$	$\frac{1}{9}[\underline{U}\ \underline{V}\ \underline{W}]$
11	$x=a\cos\theta$, $y=b\sin\theta$ are parametric equations of :	Circle	Parabola	Ellipse	Hyperbola
12	Domain of $f(x)=\sqrt{x+1}$ is:	$[-1,+\infty)$	$(-\infty,+\infty)$	$(0,+\infty)$	$[0,+\infty)$
13	If $y=\tanh^{-1}x$, then $\frac{dy}{dx}=$:	$\frac{1}{1+x^2}$	$\frac{1}{1-x^2}$	$\frac{-1}{1+x^2}$	$\frac{-1}{1-x^2}$
14	$\frac{d}{dx}(a^{\lambda x})=$:	$a^{\lambda x}$	$a^{\lambda x}\cdot\ell na$	$\lambda a^{\lambda x}\cdot\ell na$	$\frac{a^{\lambda x}}{\lambda\ell na}$
15	$\frac{d}{dx}(\sin\sqrt{x})=$:	$\cos\sqrt{x}$	$\cos\sqrt{x}\cdot\frac{1}{\sqrt{x}}$	$\sqrt{x}\cos\sqrt{x}$	$\cos\sqrt{x}\cdot\frac{1}{2\sqrt{x}}$
16	$\frac{d}{dx}\left(\ell n(e^x)\right)=$:	$\frac{1}{e^x}$	e^x	1	e^{2x}
17	$\int\frac{1}{\cos^2x}dx=$:	$\frac{1}{\sin^2x}+c$	$\tan x+c$	$\sec^2x+c$	$\operatorname{cosec}^2x+c$
18	Suitable substitution to evaluate $\int\frac{1}{\sqrt{x^2-a^2}}dx$ is :	$x=a\sin\theta$	$x=a\tan\theta$	$x=a\sec\theta$	$x=a\cos\theta$
19	$\int(\sec^2\theta-\tan^2\theta)\,d\theta=$:	$\theta+c$	$\sin\theta+\cos\theta+c$	$2\sec\theta-2\tan\theta+c$	$\tan\theta-\cot\theta+c$
20	$\int_{-\pi/4}^{\pi/4}\sec^2\theta\,d\theta=$:	1	2	Zero	3

Intermediate Part Second

Roll No. ________

MATHEMATICS (Subjective) Group – I

Time: 02:30 Hours Marks: 80 FBD-G1-22

SECTION – I

2. Attempt any EIGHT parts: 16

(i) Prove that $\operatorname{sech}^2 x = 1 - \tanh^2 x$

(ii) Find $f^{-1}(x)$ if $f(x) = (-x+9)^3$

(iii) Evaluate $\lim_{x \to \pi} \frac{\sin x}{\pi - x}$

(iv) Express the perimeter P of square as a function of its area A.

(v) Evaluate $\lim_{x \to 3} \frac{x-3}{\sqrt{x}-\sqrt{3}}$

(vi) Find the derivative of $y = \left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2$ with respect to x

(vii) If $y = \sqrt{x + \sqrt{x}}$, then find $\frac{dy}{dx}$

(viii) Differentiate $\sin x$ w.r.t. $\cot x$

(ix) Find $\frac{dy}{dx}$ if $y = x\, e^{\sin x}$

(x) If $f(x) = e^x(1 + \ell n x)$, find $f'(x)$

(xi) Determine the intervals in which $f(x) = x^2 + 3x + 2,\ x \in (-4, 1)$ is increasing.

(xii) If $y = \tanh(x^2)$, then find $\frac{dy}{dx}$

3. Attempt any EIGHT parts: 16

(i) Using differentials find $\frac{dy}{dx}$; $x^2 + 2y^2 = 16$

(ii) Evaluate $\int (\sqrt{x}+1)^2\, dx$

(iii) Evaluate $\int \frac{dx}{(x^2 + 4x + 13)}$

(iv) Evaluate $\int x^2 \sin x\, dx$

(v) Evaluate $\int e^{2x}[-\sin x + 2\cos x]\, dx$

(vi) Evaluate $\int \frac{3x+1}{x^2 - x + 6}\, dx$

(vii) Evaluate $\int_{-1}^{1} (x^{\frac{1}{3}} + 1)\, dx$

(viii) Find the area between the x-axis and the curve $y = x^2 + 1$ from $x = 1$ to $x = 2$

(ix) Find the points trisecting the join of $A(-1, 4)$ and $B(6, 2)$.

(x) Find an equation of the horizontal line through $(7, -9)$.

(xi) Convert $15y - 8x + 3 = 0$ in normal form.

(xii) Find the lines represented by $10x^2 - 23xy - 5y^2 = 0$

4. Attempt any NINE parts: 18

(i) Define the optimal solution.

(ii) Indicate the solution set by shading of $2x + y \le 6$

(iii) Find an equation of the circle with ends of a diameter at $(-3, 2)$ and $(5, -6)$

(iv) Check the position of the point $(5, 6)$ with respect to the circle $x^2 + y^2 = 81$

(v) Write an equation of parabola with given elements : Directrix $x = -2$, Focus $(2, 2)$

(vi) Form the equation of ellipse from center $(0, 0)$; focus $(0, -3)$, vertex $(0, 4)$

(vii) Investigate the center and foci of $\frac{y^2}{16} - \frac{x^2}{9} = 1$

(Continued P/2)

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(viii) If O is the origin and $\overrightarrow{OP} = \overrightarrow{AB}$, find the point P when A and B are (–3, 7) and (1 , 0)

(ix) Find α, so that $|\alpha\underline{i} + (\alpha+1)\underline{j} + 2\underline{k}| = 3$

(x) Show that the vectors $2\underline{i} - \underline{j} + \underline{k}$, $\underline{i} - 3\underline{j} - 5\underline{k}$ and $3\underline{i} - 4\underline{j} - 4\underline{k}$ form the sides of a right triangle.

(xi) Calculate area of the parallelogram whose vertices are P(0, 0, 0), Q(– 1, 2, 4), R(2, –1, 4) and S (1, 1, 8)

(xii) Prove that A(– 3, 5, – 4), B(–1, 1, 1), C(–1, 2, 2) and D(–3, 4, –5) are coplanar.

(xiii) Give a force $\underline{F} = 2\underline{i} + \underline{j} - 3\underline{k}$ acting at a point A(1, –2, 1). Find the moment of $\underline{F}$ about the points B(2, 0, –2)

SECTION – II   Attempt any THREE questions. Each question carries 10 marks.

5. (a) For the real valued function $f(x) = (-x+9)^3$ find
   (i) $f^{-1}(x)$ (ii) $f^{-1}(-1)$ and verify $f(f^{-1}(x)) = f^{-1}(f(x)) = x$ — 05

   (b) If $y = e^x \sin x$, show that $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 2y = 0$ — 05

6. (a) Evaluate: $\int e^x \left(\frac{1+\sin x}{1+\cos x}\right) dx$ — 05

   (b) Find h such that the points A(h , 1) , B(2 , 7) and C(–6 , –7) are the vertices of right triangle with right angle at the vertex A. — 05

7. (a) Evaluate $\int_0^{\frac{\pi}{4}} \cos^4 t \, dt$ — 05

   (b) Graph the feasible region of the linear inequality and also find corner points:
   $x + y \le 5$, $-2x + y \le 2$, $x \ge 0$, $y \ge 0$ — 05

8. (a) Find an equation of the line through the intersection of the lines $x + 2y + 3 = 0$, $3x + 4y + 7 = 0$ and making equal intercepts on the axes. — 05

   (b) Find an equation of the circle passing through A(– 3 , 1) with radius 2 and center at $2x - 3y + 3 = 0$ — 05

9. (a) Find foci, center, vertices and directrices of hyperbola $4y^2 + 12y - x^2 + 4x + 1 = 0$ — 05

   (b) Find a unit vector perpendicular to plane containing $\vec{a}$ and $\vec{b}$. Also find the sine of angle between them. $\vec{a} = 2\hat{i} - 6\hat{j} - 3\hat{k}$, $\vec{b} = 4\hat{i} + 3\hat{j} - \hat{k}$ — 05